Feb. 20, 1968 A. M. SCHAIBLE 3,369,760

LIQUID MANURE SPREADER

Filed Sept. 13, 1965

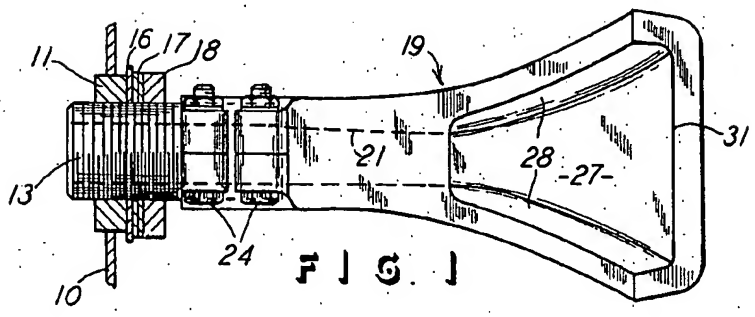

FIG. 1

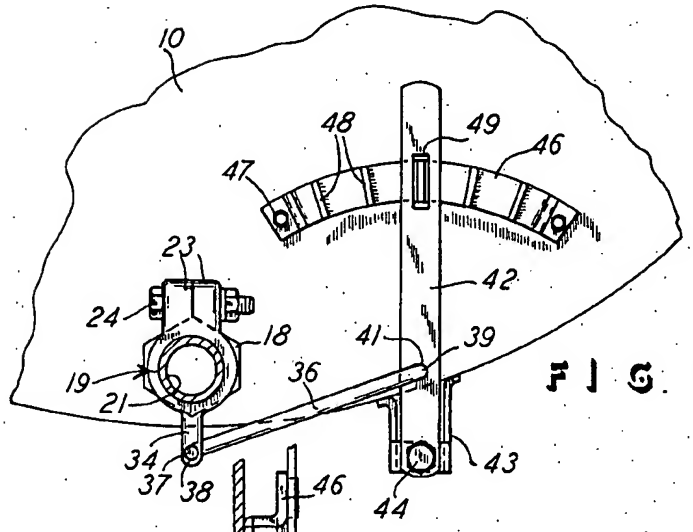

FIG. 3

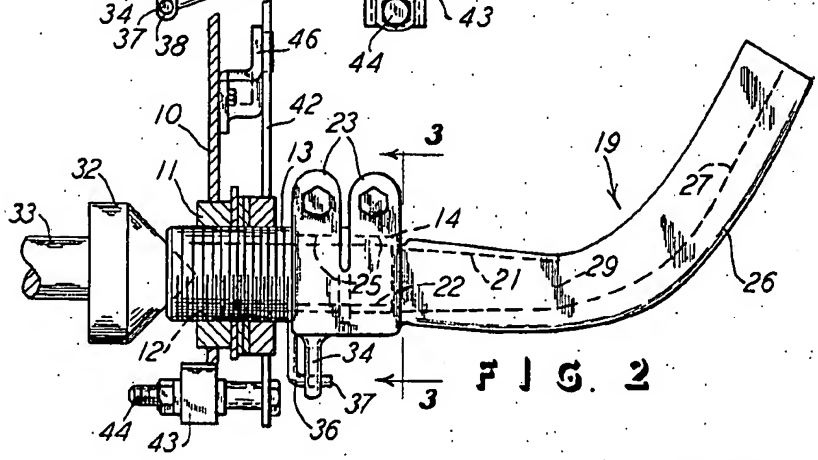

FIG. 2

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United States Patent Office 3,369,760
Patented Feb. 20, 1968

3,369,760

LIQUID MANURE SPREADER

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Filed Sept. 13, 1965, Ser. No. 486,841
3 Claims. (Cl. 239—513)

ABSTRACT OF THE DISCLOSURE

A liquid manure spreader fan which is rotatable on a tank by means of adjustment members connected to the fan. Indexing means cooperates with the adjustment members to hold the latter in selected positions for selective positioning of the spreader fan.

This invention relates to a liquid manure spreader, and, more particularly, it relates to a liquid manure spreader of the type which utilizes a tank which opens to a spreader fan adjustably mounted on the tank to control the pattern of discharge of the liquid manure from the tank as the latter progresses over the ground.

It is a general object of this invention to provide a liquid manure spreader which improves the distribution of the liquid manure over an area of ground traversed by the spreader. More especially, it is an object of the invention to produce a flat and even discharge of liquid manure from the transport tank. In accomplishing these particular objects, the result is that the problem of burning the crop under the tank opening, due to the heavy concentration of manure in this area when using the splash plate spreader construction, will be eliminated.

Another object of this invention is to provide a liquid manure spreader which does not have complicated operating mechanism subject to failure, and thus the spreader of this invention is easily manufactured, easily operated, more readily maintained, more reliable in its operation, and the like.

Still another specific object of this invention is to provide a liquid manure spreader utilizing a spreader fan which incorporates an orifice and a tapered throat of maximum size to allow solids to pass through easily but which still increases the velocity of the material sufficiently to produce an even spreader of the manure. Also, the spreader fan is constructed with a guide vane and venturi throat of a uniform taper to eliminate turbulence in the discharge of the manure and to create a uniform section of liquid manure.

Still another object of this invention is to provide a liquid manure spreader which is readily and easily adjustable to govern and alter the pattern of discharge of the liquid manure. Specifically, the spreader fan can be aimed or rotated with respect to the transport tank so that the manure can be distributed upwardly, downwardly, or even to the side, all as desired.

Other objects and advantages become apparent upon reading the following description in light of the accompanying drawings, wherein:

FIG. 1 is a top plan view of the spreader fan used in this invention and showing a fragment of the transport tank and its mounting in section.

FIG. 2 is a side elevational view of FIG. 1, and with a valve closure added thereto.

FIG. 3 is an end elevational view of the transport tank showing the adjusting and securing mechanism for the spreader fan and with the view being a section taken along the line 3—3 of FIG. 2.

A fragment of a pressurized tank is shown by the tank end wall 10 which has a bushing 11 secured thereto having a threaded hole 12 therein. A pipe 13 is threaded into the bushing 11 to be in fluid-flow communication with the interior of the tank, and the pipe has an end designated 14 extending outside the tank wall 10. A gasket 16, washers 17, and a nut 18 are shown on the pipe 13 to make it fluid tight with the tank wall 10.

A spreader fan, generally designated 19, is secured to the pipe end 14 and is rotatable thereon. The fan 19 has a tapered opening 21 extending through a portion of the fan 19, and the opening 21 is aligned with and in fluid-flow communication with an axial opening 22 in the pipe 13. Thus, material flowing from the tank and into the pipe opening 22 will continue through the fan opening 21 in its flow outwardly from the tank.

Fan clamp portions 23 are included in the fan 19 to secure the fan on the pipe end 14. Bolts 24 extend through the clamp portions 23 for the securing purpose described. This particular arrangement can of course be in any well-known manner so that the fan 19 will be fluid tight but rotatable on the pipe end 14, as mentioned. It can be the tongue-and-groove connection 25.

The fan 19 has an arcuate end 26 which presents a surface 27 and flanking surfaces 28, all three of which extend from the outlet 29 of the fan tapered opening 21. Thus it will be understood that material flowing through the opening 21 will be under pressure and it will be spread out when it passes the outlet 29. The surfaces 27 and 28 will then contain the material which will be evenly distributed along the surface 27 and will be confined by the surfaces 28. The pattern of discharge will naturally be upwardly when the fan is in the upwardly directed position as shown in FIG. 2.

It will also be noted that the surface 27 is tapered or flared toward its discharge edge designated 31, with respect to the portion adjacent the outlet 29.

It will thus be understood that the tank will be transported over the ground to be fertilized, and the liquid manure within the tank will be under pressure so that it will be forced through the openings 22 and 21 and beyond the spreader fan 19. A conically shaped closure 32 is shown in FIG. 2 to be aligned with the axis of the pipe opening 22 for selective opening and closing of the opening 22. Thus a shaft 33 is attached to the closure 32, and the shaft may be suitably mounted and controlled so that the operator can move the closure 32 axially for opening and closing of the discharge opening 22. This control of course could be in any suitable manner and governed by the operator.

To adjust and secure the spreader fan 19 in selected rotated positions, adjustment means are shown in FIG. 3. The fan 19 has an arm 34 attached thereto and extending therebelow in the FIG. 3 position. A connecting rod 36 has an end 37 extending into an opening 38 in the lower end of the arm 34 to attach to the arm 34. The other end of the rod 36 has another angled end 39 which extends into an opening 41 in a pivotally mounted adjustment arm 42. Thus it will be understood that pivotal movement of the adjustment arm 42 will cause displacement of the connecting rod 36 and rotation of the fan 19 so that the desired pattern of manure distribution can be obtained.

The arm 42 is shown mounted on a bracket 43 secured to the circumference of the tank wall 10. The bracket 43 supports a bolt 44 which provides the pivotal mounting and pivot axis for the arm 42.

An adjustment brace 46 is arcuately shaped and attached to the wall 10 by means of screws 47 extending through the ends of the brace 46 and into the wall 10. The brace 46 contains lugs 48 which are received by an opening 49 in the arm 42. The mating of the lugs 48 in the opening 49 secures the arm 42 in a selected pivotal position. Thus the arm 42 can be moved clockwise or counterclockwise, that is in both clockwise directions, about the axis of the bolt 44, and such movement will induce similar

rotation in the fan 19. If it were desired to completely invert the fan 19 from the so-called upright position shown in FIG. 2, then the connecting arm 36 can be disconnected from either the fan arm 34 or the adjustment arm 42, and the fan can then be rotated 180 degrees and the arm 36 can again be connected then extending above the fan 19.

There may be a plurality of adjustable fans 19 on the tank for covering a desired path in fertilizing. Each one may be adjustable, as described, and also have the adjustment means, which is an indexing means too.

While a specific embodiment of this invention has been shown and described, it should be obvious that certain changes could be made in the embodiment and the invention should therefore be determined only by the scope of the appended claims.

What is claimed is:

1. A liquid manure spreader comprising a tank for containing liquid manure in a semi-solid state, a spreader fan rotatably connected to said tank and having an orifice in fluid-flow communication with the interior of said tank, said spreader fan including an arcuate and flared surface extending on the projection of the axis of said orifice in the downstream direction from the outlet of said orifice for receiving the liquid manure passing through said orifice and baffling it to throw it into the air in a fan-shaped pattern, adjustment means connected to said spreader fan and extending therefrom in a direction transverse to the axis of said orifice for rotating said spreader fan about the axis of said orifice and relative to said tank, lock means connected to said adjustment means and said tank for releasably securing said adjustment means and said spreader fan in selected rotated positions, and wherein said adjustment means includes a linkage engageable with said lock means and being pivotal between selected pivoted positions for setting said spreader fan in selected rotated positions.

2. The subject matter of claim 1, wherein said lock means includes indexing means having a plurality of index stops for releasably setting said adjustment means in said selected rotated positions.

3. The subject matter of claim 1, wherein said adjustment means includes a pivot arm and said lock means has a plurality of index stops for setting said pivot arm in selected positions.

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Nov. 7, 1967 W. P. POHLE 3,351,291

LIQUID DISCHARGING DEVICE HAVING MEANS FOR REDIRECTING AND DISPERSING THE EFFLUENT

Filed April 28, 1965

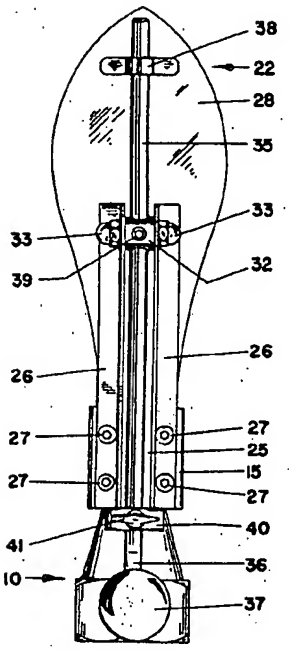

FIG. 1

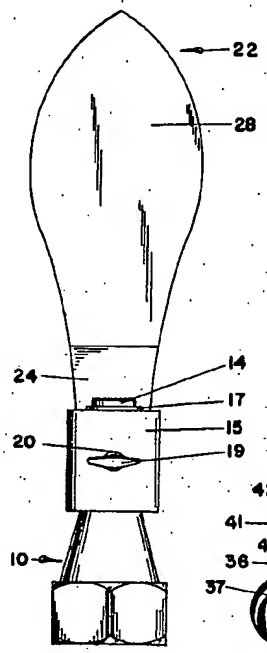

FIG. 2

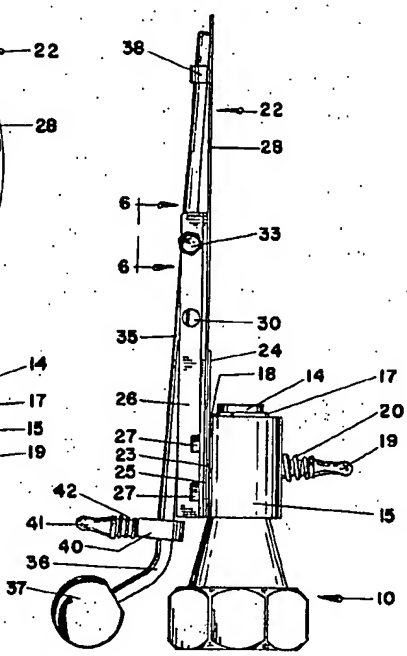

FIG. 3

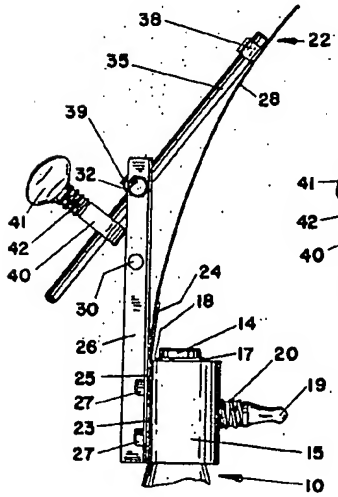

FIG. 4

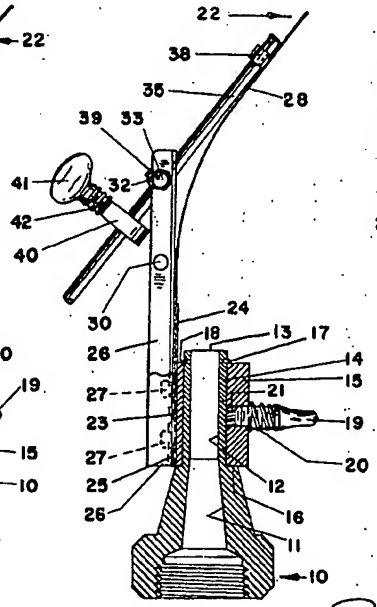

FIG. 5

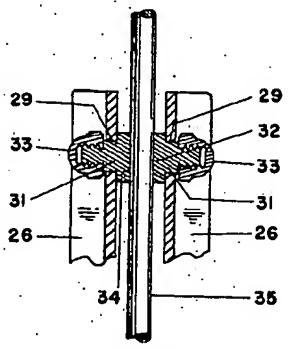

FIG. 6

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United States Patent Office 3,351,291 Patented Nov. 7, 1967

3,351,291

LIQUID DISCHARGING DEVICE HAVING MEANS FOR REDIRECTING AND DISPERSING THE EFFLUENT

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Filed Apr. 28, 1965, Ser. No. 451,602
4 Claims. (Cl. 239—511)

The present invention relates to liquid discharge devices in the operation of which a flowing stream is redirected and dispersed by some surface means positioned beyond the egress port or last point of fluid confinement and in a direct line therewith to accomplish a change in the direction of flow of the fluid. Such surface means is usually called a deflector by which there is meant a solid means arranged exteriorly of the egress port to disperse and redirect the effluent and change its characteristics, as from a solid stream substantially circular in cross section to a flattened or fan-shaped discharge or curtain. To accomplish this result the deflector surface is arranged to one side of the general direction of the discharging stream, is flattened or presents a surface of comparatively large area, and may be stationary or is movable to various positions relative to the outlet means to vary the amount of dispersion of the fluid or the direction thereof, or both.

One such deflector-type discharging device is disclosed in U.S. Letters Patent No. 2,122,559, granted July 5, 1938, to Louis G. Dapero et al. for plant husbandry nozzle structure adapted for spraying trees. There is shown by the Daperos a deflector which may be flexed to various positions and which is manually controlled, is intended for use with low pressures on the liquid, and requires constant manipulation, i.e., control, by the operator himself not only to turn the discharge from side to side as desired but also as to maintain the deflector-flexing means in deflector-flexing position during use.

In contrast, the present invention contemplates embodiments which can be operated at high fluid pressures and therefore provides that while the deflector-flexing means be operated manually to put it in a position for use, structure of the discharge device itself functions to maintain the deflector-flexing means in a deflector-flexing position during operation, thereby eliminating the need of handling by the operator for this purpose during use and leaving him free for other work such, for example, as operating a monitor on which the structure may be mounted or turning the discharge about an axis if this operation is called for. It is contemplated that embodiments of the present invention be used for producing a curtain of water useful in fire fighting, and the pressures contemplated here range upwardly from fifty pounds p.s.i. to and including the great pressures and volumes used by firemen who frequently employ nozzles having a three inch diameter orifice. It is also contemplated that monitor-mounted embodiments be carried by railroads, for example, so that weed killing chemicals may be sprayed at each side of the tracks. In another aspect it is contemplated that embodiments be truck-mounted and spray a water-seed-soil mixture for sowing along embankments siding highways or spraying liquid fertilizer on embankments already succeded. In all of these applications the pressures used make it desirable that the operator himself not be the means for maintaining the deflector-flexing means in operating position, so that liquid dispersion can be uniform and constant and not irregular and so that the operator is free to direct the apparatus as a unit or turn the discharge to vary its direction.

It is therefore the principal object of the present invention to provide certain improvements in the Dapero nozzle and therefore to provide a liquid discharge structure of

the flexible deflector type which is of more general utility and is better adapted for a variety of uses.

To the accomplishment of this object and of such others as will appear hereinafter, the various features of the present invention reside in certain constructions, combinations, and arragements of parts which are all fully described in this specification and then are set forth in the appended claims the subject matters of which possess advantages which will be readily apparent to those skilled in the art.

The various features of the present invention will be readily understood from reading this specification in the light of the accompanying drawing which illustrates the best physical embodiment of the invention at present known to the inventor and in which:

FIGURE 1 is a view in rear elevation of the liquid discharging device as a whole, the deflector being unflexed, i.e., in a position of disuse;

FIG. 2 is a view of the FIG. 1 structure in front elevation;

FIG. 3 is a view of the FIG. 1 structure in left side elevation;

FIG. 4 is a view in left side elevation, with part of the nozzle body and part of the deflecting rod being cut away, showing the flexing of the deflector and of the stiffener under the influence of the flexing rod;

FIG. 5 which is partially in section, is a view similar to FIG. 4 but showing the increased flexing of the deflector and decreased flexing of the stiffener as the result of the impact of a jet of liquid on the deflector; and

FIG. 6 is a detail view in elevation, partially in section, taken along the line 6—6 of FIG. 3, showing the pivot construction for the flexing rod.

Referring to the drawing, the illustrated embodiment of the present invention is provided with a nozzle body indicated generally at 10 which is internally threaded at its inlet end for connection with a suitable source of liquid under pressure, and has a tapered interior 11 (FIG.5) leading to a cylindrical passage 12 terminating in an egress port 13 for the liquid. The nozzle body 10 is formed as a cylinder 14 exteriorly of the passage 12 to receive rotatably a collar 15 the lower end of which abuts an annular shoulder 16 (FIG. 5) formed on the nozzle body 10. The upper end of the collar 15 engages a split ring 17 received by an annular recess 18 formed in the cylinder 14 just above the collar 15 so that the collar is retained on the nozzle body 10 but is rotatable thereon. A thumb screw 19 with a spring 20 coiled about its shank functions to maintain the collar 15 stationary on the nozzle body 10 in any desired rotative position with respect to the axis of the cylinder 14, there being preferably a replaceable pressure piece 21 of some relatively yielding material, such as nylon, to give one example, located between the tip of the screw 19 and the wall of the cylinder 14 so that the material of the cylinder is not scored or dented by repeated tightenings of the screw 19. It is to be understood, however, that in uses of embodiments of the present invention it is contemplated that the screw 19 not be tight, so that the collar 15 and structure carried thereby, as will be explained, may be turned about the axis of the cylinder 14.

The cylindrical passage 12 within the nozzle body 10 functions as a last region of fluid confinement before discharge from the egress port 13 and serves to cause the stream to flow axially of the nozzle body. In order that the stream may be both redirected and dispersed upon leaving the port 13, the present invention contemplates the presence of a surface means 22, i.e., a deflector, arranged exteriorly of the port 13 for movement into and out of a position in which a portion of its surface is in the path of discharge from the port 13. While such a deflector could be mounted directly on the nozzle body 10, it

is preferred, to permit rotative adjustment, that it be mounted on the collar 15, and to this end a portion of the collar is flattened throughout its length to provide a rearward plane surface 23 which receives flatwise the front face of a plate 24 the functions of which will be described. Abutting flatwise the rear face of the plate 24 is the front face of the lower end portion 25 of the deflector 22, and abutting flatwise the rear face of the deflector 22 for a portion of its length are the corresponding legs of two spaced angles 26. Cap screws 27 serve to mount the angles 26, deflector portion 25, and plate 24 rigidly on the collar 15.

The deflector 22 extends forwardly of the nozzle body 10 and generally intermediate its opposite ends is preferably considerably wider than the diameter of the nozzle body cylindrical passage 12. The forward edges of the deflector 22 are shown as curving convergingly (FIGS. 1 and 2) to meet in a blunt forward tip, although the particular terminal front edge formation shown is not essential to the present invention. The material of the deflector is resilient sheet or strip so that the deflector may be flexed, as will be described, and this flexing is of what may be called the free end portion 28 as opposed to the deflector end portion 25 which is rigid by reason of the cap screw mounting 27. The deflector is flat when in unflexed condition (FIGS. 1, 2, and 3) and when unflexed, i.e., in a position of disuse, its free end portion 28 is to one side of and is spaced from the axis of discharge of the nozzle cylindrical passage 12. It is not intended or necessary that the deflector 22 be of spring material.

Referring to FIGS. 1, 3, 4, and 5, the angles 26 are shown merely for illustrative purposes as extending upwardly from the collar 15 for more than half their length, and they are mounted on the collar in spaced relation so that their legs engaging the rear face of the deflector portion 25 are directed away from each other and so that the outstanding legs form, with the back of the deflector 22, a sort of channel construction which may be regarded as parallel with the axis of discharge from the nozzle body 10. The outstanding legs of the angles 26 are provided with preferably several pairs of aligned apertures, one pair of which is located adjacent the free ends of the angles 26, as at 29 in FIG. 6, and another pair of which may be located as desired spaced from the angle free ends, as at 30 in FIGS. 3, 4, and 5. Pivotally received in the apertures 29 are the reduced end portions 31, respectively (FIG. 6), of a spindle 32, and these end portions are terminally threaded to receive retaining acorn nuts 33 to maintain the spindle 32 in place while permitting it to move about its longitudinal axis. To this end it will be noted from FIG. 6 that the threading of the spindle portions 31 does not extend inwardly to the outstanding legs of the angles 26, so that they are not engaged by the nuts 33 when tight. As best shown in FIG. 1, the deflector 22 and the angles 26 are so mounted on the collar 15 that the angles are situated on the opposite sides, respectively, of the longitudinal center line of the deflector. The body of the spindle 32, being mounted between the angles 26, is thus located over the longitudinal axis of the deflector 22, and the purpose of the spindle is to serve as the axis of swinging of a means for flexing the deflector into and also out of positions in which it is in the path of the discharge from the nozzle 10.

To this end the spindle 32 is provided with a through passage 34 (FIG. 6) which is located between and is parallel with the outstanding legs of the angles 26 and which receives slidably a stiff rod 35 the lower end portion of which may be bent, if desired, as at 36 (FIGS. 1 and 3) and which may receive a knob 37. The axis of the passage 34 is parallel with the longitudinal axis of the deflector 22 and is located in a plane normal to the axis of pivoting of the spindle 32, and the upper portion of the rod 35 is slidable under the arch of a strap 38 the opposite ends of which are secured, as by spot welding or brazing, to give two examples, to the rear face of the deflector 22 adjacent its forward end so as to be carried thereby, and the upper end of the rod 35 engages the deflector 22 adjacent its tip as shown in FIGS. 3, 4, and 5. The rod 35 is made stationary relatively to the spindle 32 in any desired position by means of a set screw 39 with the result that the rod and spindle are swingable together while any sliding of the rod along the passage 34 is prevented.

With this construction it will be seen by comparing FIGS. 3 and 4 that when the rod 35 is swung so that the knob 37 moves away from the nozzle body 10, the rod portion forwardly of the spindle 32 swings forwardly, positively pressing against the upper portion of the back of the deflector 22 adjacent its forward tip so that its free end portion 28 is flexed into a position in which it is located in the path of discharge of the nozzle body 10. It will also be seen, by again comparing FIGS. 3 and 4, that while during this flexing of the deflector 22 the strap 38 moves forwardly, as it were, relatively to the free end of the rod 35, the arch of the strap 38 remains over the rod so that the strap engages and coacts with the rod to move the deflector positively and effect its return to its deflexed or FIGS. 1, 2, and 3 position of disuse out of the path of discharge from the nozzle 10 and spaced from the axis of its discharge, when the knob 37 is moved toward the nozzle body to swing the upper end of the rod 35 in the opposite direction. The extent to which the deflector is flexed by the rod 35 depends, of course, upon the extent to which the rod is swung, and to maintain the rod 35 in any one of a plurality of positions of deflector flexing against any tendency of the flexed deflector to swing the rod back in the opposite direction so that the deflector is in a deflexed position of disuse, the rod 35 slidably receives and carries between the knob 37 and the spindle 32 a collar 40 in which is mounted the shank of a thumb screw 41 urged to remain in tight condition by a coil spring 42, as is well understood. By reason of the collar 40 being movable on and relatively to the rod 35, the collar is engageable with the outstanding legs of the angles 26, as indicated in FIGS. 4 and 5, and when held in fixed position on the rod 35 by the screw 41 thus provides a stop means to prevent any swinging of the rod 35 and spindle 32 which would move the rod out of any particular deflector-flexing position determined by the location of the collar 40 relatively to the rod 35. It will be appreciated that as an alternative to the collar 40, the angles 26 could support an adjustable slide (not shown) which the rod 35 itself could abut and which would thus be a stop equivalent to the collar 40-angles 26 arrangement illustrated.

While remarks made supra show the two facts that the deflector 22 is flexed by the rod 35 when the knob 37 is moved away from the nozzle body 10 and that the coaction of the collar 40 with the angles 26 functions as a stop to maintain the rod 35 in deflector-flexing position against the tendency of the deflector to resume its unflexed condition, there are several considerations to which attention should be called in connection with these two facts.

The first of these considerations is that while the deflector 22 may be of relatively thin material or of relatively thick material, or of material having anw thickness therebetween—with the result that the resiliency may be relatively great or relatively small or any degree therebetween, the deflector all the while being accurately described as "resilient" or "flexible"—if the lower end portion 25 of the deflector is in direct engagement with the flat face 23 on the collar 15, the deflector might tend to bend relatively sharply directly across the top edge of the collar face 23 as the rod 35 is moved to flex the deflector, with the two undesirable results that the greater part of the deflector free end portion 28 would be beyond the path of discharge from the nozzle 10 and the lower part of the free portion 28 would be relatively near the

egress port 13. This latter adjacency could be in part obviated, of course, by giving the collar 15 such a greater diameter that the rigid portion 35 of the deflector would be considerably spaced from the axis of discharge of the nozzle in contrast to the spacing indicated in FIGS. 3, 4, and 5, but this would increase the size, weight, and cost of the construction and is therefore to be avoided. As a consequence it is prefered that means be provided to cause the flexing of the free portion 28 of the deflector to be less sharp at its lower end and instead to be a gradual curve over and beyond the path of discharge of the nozzle, and this is one of the functions of the plate 24 which is located between the collar face 23 and the lower end portion 25 of the deflector. The plate 24 is also made of resilient material so as to be flexible and may be shorter or longer than indicated in FIGS. 2–5, but is in any event relatively short as compared to the length of the free end portion 28 of the deflector, with the result that even if it is made of material identical with that of the deflector, it is stiffer, i.e., less resilient, by reason of its shortness, and therefore may be termed a stiffener by reason of its function. Stating this in different words, the plate 24 offers a yielding resistance to the flexing of the deflector 22 under the influence of the rod 35 so that the free end portion 28 of the deflector does not bend sharply across the top edge of the collar face 23 but instead bends in a gradual curve from the top of the collar, the gradualness depending upon the amount of yield of the plate 24 which of course flexes also since it is made of resilient material. One example of such a gradual curve is shown in FIG. 4. It should be pointed out here also that while only one plate 24 is shown in the drawing, it is contemplated that two or more plates be used, a second, for example, being located between the deflector 22 and the plate 24 and being somewhat longer than the latter so as to extend thereabove, viewing FIGS. 3, 4, and 5. The use of two or more stiffener plates as described is suggested when it is desired to have the free portion 28 of the deflector begin deflection at a level higher than indicated in FIG. 4, thus providing a somewhat sharper curving across the path of discharge but beginning at a level above the collar 15.

As a second consideration following from the flexing of the deflector, the remarks in the two paragraphs next preceding above are phrased as though the nozzle structure were in disuse, or were in adjusted condition for use but prior to the passage of liquid therethrough. The deflector would thus be in a flexed condition as determined by the location of the rod 35 which is in turn determined by the setting of the collar 40. When, however, liquid is discharged from the egress port 13, the impact force of the discharge on the deflector causes its flexure contour, i.e., its curve, to change, one such change being shown in FIG. 5 in contrast to FIG. 4. Stating this in a different way, and without regard at this point in this specification to the extent or manner in which the stream is dispersed, the deflector 22 is flexed, i.e., pushed, back by the force of the discharge so that it may be considered as having a sort of shorter radius, as it were, as can be seen by comparing the FIG. 5 deflector curvature with that of FIG. 4. Assuming sufficient liquid force for FIG. 5, the lower part of the free portion 28 of the deflector may move back into abutment with the angles 26, as shown, the stiffener 24 may be completely deflexed, i.e., as in FIG. 1, the flexure curvature of the deflector 22 commencing at a level above the plate 24, and to a very appreciable extent the rear face of the deflector 22 free portion 28 may be engaged along a line with the rod 35 as a backer. A lesser liquid pressure would give the deflector 22 and plate 24 flexure curvatures somewhat between those of the FIGS. 4 and 5 showings, while a greater liquid pressure would cause the flexing of the deflector 22 to commence at an even higher point than shown in FIG. 5.

The location of the deflector 22 across the path of discharge of the nozzle 10 causes a change in the direction of flow of the liquid and results in its dispersion and breaking up into a curtain or drops of various sizes in a general fan shape. All this is well understood in the use of deflector-type nozzles and will not be gone into in detail here, but in connection with this dispersion and the reason for it, and as a third consideration, attention is called to the fact that by means of the present invention the force of the impact of the discharge upon the deflector 22, in addition to changing the flexure of the deflector, serves to cause the deflector to exert rearward pressure on the rod 35 above the axis of the spindle 32 since the dispersed liquid flows to and over the free or upper end of the deflector 22 and therefore causes the portion of the rod 35 below the spindle 32 to tend to swing inwardly toward the angles 26. This causes the collar 40 to maintain its engagement with the angles 26, and rod swinging does not take place because of this engagement. Stating this last differently, while the natural resilience of the deflexed deflector, and of the plate 24 or plates, when used, causes them to tend to swing the rod 35 in a reverse direction so that the parts named become unflexed, i.e., in FIGS. 1, 2, and 3 position, and while this tendency to thus swing the rod 35 is greatly augmented by the force of the liquid discharge against the deflector, yet the rod 35 does not swing because of the stop afforded by the collar 40 engaging the angles 26. The rod 35, i.e., the deflector flexing means, is thus maintained in deflector-flexing position by features of the nozzle structure itself, and because it is intended that high liquid pressures be used with embodiments of the present invention, this last is of great importance in practical applications of the present invention. The mechanical manner of maintaining the flexing means in position regardless of the amount of force of the impact of the liquid stream on the deflector stands out in marked contrast to the necessity of the operator himself having the task of maintaining a flexing means in a given position, a task not performable with high liquid pressures and probably not performable with even low pressures since there would be bound to be some flutter of the flexing means even under such conditions.

In view of the foregoing it is believed that little more need be said concerning embodiments of the present invention. If desired, the edges of the outstanding legs of the angles 26 may be serrated so as to have teeth resembling those of a rack, and the rod 35 may receive a collar having a periphery to fit between successive teeth on the angles 26. Such a construction is another equivalent of the angles 26-collar 40 structure illustrated, and it will be appreciated that the resiliency of the deflector 22 and the force of the discharge from the nozzle 10 against the deflector would exert rearward pressure on the rod 35 above the spindle 32 to cause the modified collar to remain in tooth engagement and perform its stop means function. While the spindle 32 is shown as mounted in the apertures 29 (FIG. 6) in the angles 26, the spindle may be mounted lower, as in the apertures 30, if desired, to cause the deflector 22 to be flexed by the rod 35 into flexure contours somewhat different than those shown, and by the same token it is contemplated that the angles 26 may be longer, i.e., higher, than shown, with the result that when the spindle 32 is mounted adjacent the free ends of such angles, particularly when used in connection with two or more stiffener plates as described above, a particularly sharp curvature can be given to the deflector 22 by the rod 35, beginning well above the collar 15. It will also be appreciated that while the strap 38 coacts slidingly with the rod 35 to move the deflector positively to deflexed condition, the strap 38, by reason of being fixed on the deflector 22, also acts as a guide to constrain the swinging of the rod 35 to a plane normal to the axis of the spindle 32. As shown in FIG. 1, the rod 35 and arch of the strap 38 lie along the major axis of the deflector so that with this construction the deflector is always flexed and deflexed in a regular manner transversely

of the path of discharge of the nozzle. It is preferred in embodiments of the present invention that the support for the spindle 32 be angles rather than rods or bars or other shapes, the reason being that I have found that angles provide maximum stiffness and resistance to the thrust exerted on the rod 35 by the deflector 22 under the influence of the impact thereagainst of the discharged liquid. With the nozzle 10 mounted on a suitable source of liquid under pressure, which may be a hose or a monitor carried by a vehicle, for examples, the collar 15 may be made stationary on the nozzle by the thumb screw 19, or by loosening the screw the collar 15 and therefore the deflector 22 and coacting parts may be turned to right or left rotatably as a unit, and this rotation may be a full 360 degrees or any lesser extent to play the discharge on the under portions of three branches or on varying contours of rights of way or roadway embankments. To effect this turning, the collar 15 may be manually turned on the cylinder 14, or the knob 37 may be used for this purpose, or the screw 19 may have a knob finally in place of the usual thumb and finger surfaces shown, or the collar may be provided with handles which are not illustrated. As a final point, while the front face of the deflector 22 is shown as unlined, it is contemplated that when a liquid discharge includes abrasive material, as dirt in a water-seed-soil discharge, a lining of some relatively soft material (not shown) be provided because its relative softness—rubber is one example—receives an abrasive discharge with less wear than does a surface of harder material. In such a construction the lining would preferably extend downwardly substantially to the bottom of the rigid deflector portion 25 and the plate 24 so as to be clamped therebetween from its bottom to a point above the collar 15.

What is claimed as new is:

1. In a liquid discharging device:
   (A) a nozzle;
   (B) a flexible deflector having an end portion rigidly mounted to locate the deflector in a position of disuse in which the free end portion of the deflector is unflexed and spaced from the axis of discharge of the nozzle;
   (C) means for flexing the deflector into the path of discharge of the nozzle, said flexing means being spaced from the rigidly mounted end portion of the deflector and said end portion being mounted independently of the flexing means;

   (D) a stiffener engageable with the deflector beyond its mounting and in the direction of the free end portion of the deflector for yieldingly resisting flexing of the deflector, said stiffener also being spaced from the flexing means; and
   (E) stop means to maintain the flexing means in deflector-flexing position against the flexing-resisting influence of the stiffener and the tendency of the flexed deflector to resume its unflexed position.

2. In a liquid discharging device:
   (A) a nozzle;
   (B) a flexible deflector having an end portion rigidly mounted to locate the deflector in a position of disuse in which the deflector is unflexed and spaced from the axis of discharge of the nozzle;
   (C) means for flexing the deflector into the path of dicharge of the nozzle; and
   (D) means carried by the deflector and engageable with the flexing means whereby the deflector is positively moved to deflexed condition during movement of the flexing means in a direction opposite to that in which it moves to cause the deflector to be flexed.

3. Structure such as set forth in claim 2 characterized by the fact that the flexing means (C) is slidable relatively to the means (D) carried by the deflector.

4. In a liquid discharging device:
   (A) a nozzle;
   (B) a flexible deflector having an end portion rigidly mounted to locate the deflector in a position of disuse in which the deflector is spaced from the axis of discharge of the nozzle;
   (C) means swingable about an axis for flexing the deflector into the path of discharge of the nozzle; and
   (D) a guide carried by the deflector and coacting with the flexing means for constraining its swinging to a plane substantially normal to its axis of swinging.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,351,291 November 7, 1967

Werner P. Pohle

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, line 63, for "succeeded" read -- seeded --; column 4, line 63, for "anw" read -- any --; column 7, line 16, for "three" read -- tree --; line 20, for "finally" read -- finial --.

Signed and sealed this 26th day of November 1968.

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents